# Technical Information Manual

Revision n. 0
12 October 2006

**MOD. A4602**
*CMS SILICON TRACKER*
*CCU RING PSM*
**MANUAL REV. 0**

**NPO:**
**00113/05:A4602.MUTx/00**

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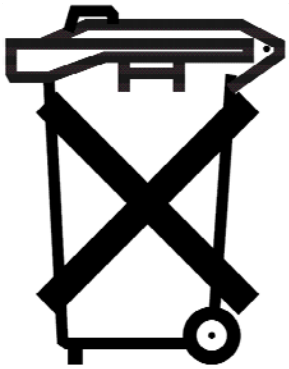
## Disposal of the Product

*The product must never be dumped in the Municipal Waste. Please check your local regulations for disposal of electronics products.*



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# 1. EASY Embedded Assembly System

## 1.1 Functional description

EASY (Embedded Assembly SYstem) is the new CAEN power supply solution for operation in magnetic field and radioactive environment. CAEN has been involved for more than a decade in developing different solutions for the main LHC experiments, where the electronic equipment of the experiment is dealing with high dose radiation and intense magnetic field. In order to provide safe and reliable operations in such hostile areas, CAEN started tests with rad-tolerant components and magnetic field resistant solutions, patenting the new technology that is now used in this new line of products. Moreover, though designed for harsh environment, the EASY modules can work also in normal condition with excellent performance. In the new architecture, the power supply can be located directly in the hostile area, where the EASY modules provide a wide variety of output voltages to satisfy the requirements of most detectors and front-end electronics. The control of the EASY power supply system is done remotely using a Branch Controller (Mod. A1676A) plugged in a SY1527 or SY2527 mainframe located in the control room. Each A1676A branch controller can handle up to 6 EASY crates: in this way, one SY1527 power supply system, for example, housing up to 16 A1676A boards, can handle up to 96 EASY systems. The EASY crate can house up to 10 boards, depending on the boards' width. The branch controller is the interface between the mainframe (SY1527 or SY2527) and the remote boards in the EASY crate: its role is to configure the EASY channels as if they belong to the supply unit slot in which the branch controller is located. All the channels of the EASY boards will be considered as channels of the branch control board, thus hugely increasing the number of channels the system can handle. Through the mainframe, the provided and fully reliable OPC server permits an immediate and "automatic" interfacing with the custom control software; moreover, a C-library for Windows and Linux is available as well. The EASY crate can be used with an air and/or water intercooler and its standard width fit the rack mounting. Fig. 1.1 shows the system's block diagram.

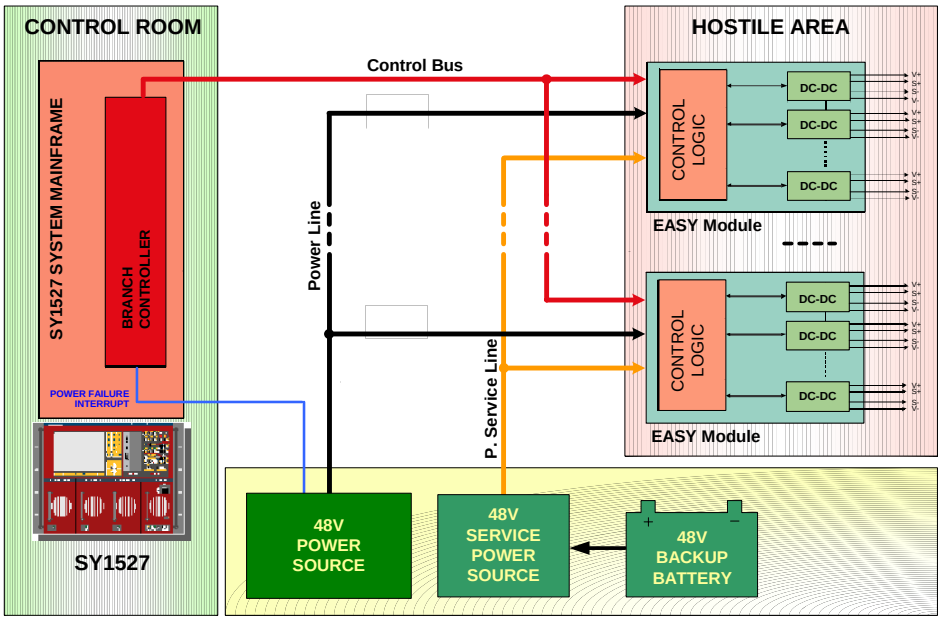


**Fig. 1.1 – System's block diagram**

## 1.2 The CAEN Multichannel Power Supply System Overview

The SY1527 system is the fully equipped experiment version of a new line of power supply systems which represent CAEN's latest proposal in the matter of High Voltage and Low Voltage Power Supplying. This system outlines a completely new approach to power generation and distribution by allowing the housing, in the same mainframe, of a wide range of boards with different functions, such as High/Low Voltage boards, generic I/O boards (temperature, pressure monitors, etc.) and branch controllers, where the latter are used to control other remote generators and distributors. Modularity, flexibility and reliability are the key-points of its design, enabling this module to meet the requirements needed in a wide range of experimental conditions, which range from those of LHC experiments, where the features of this model find prior application, to those of other less challenging, but still demanding, High Energy Physics experiments.
The mainframe is housed in a 19"-wide, 8U-high euro-mechanics rack and hosts four main sections:

- the Board Section, with 16 slots to house boards, distributors and branch controllers;
- the Fan Tray Section, housing 6 fans arranged on two rows;
- the Power Supply Section, which consists of the primary power supply and up to 3 power supply units;
- the CPU and Front Panel Section which includes all interface facilities.

The User Software Interface features the usual friendliness of the previous CAEN systems which now also includes a 7.7" colour LCD. A wide choice of interface facilities provides full communication compatibility with the previous systems and the feasibility of controlling heterogeneous external devices. Modularity has been one of the leading criteria in the design and development of the system: both the Power Supply Section and the Board Section are completely modular. The Power Supply Section allows different configurations with up to 3 power supply units per mainframe (up to 2250 W), while the Board Section can house up to 16 boards able to fulfil different functions. A complete line of power supply boards and distributors has been specially developed for this new system. The minimum system configuration consists of the primary power supply, one Power Supply Unit and one board. The system allows also to deal with power supply

solutions composed by “branch controllers” (housed in the system main frame) and on-detector “remote boards” (manufactured in order to be magnetic field and radiation tolerant). Channel trip control on other crates is performed via four external differential trip lines. A sophisticated trip handling via software allows to control and correlate trip conditions on the channels of the crate as well as of other crates connected to it. Live insertion and extraction of the boards, which reduces the down time of the global system, and easy access to the computing core and peripherals of the system complete the system flexibility. Easy interfacing is another key-point of the SY1527 system, which can be connected to SY127 and SY527 systems. The Ethernet interface (TCP/IP) allows both an easy Telnet access and the connection via OPC Server to a SCADA control system. Enhanced software programming features a unified command set independent from the interface used to communicate with the system. The Power Supply Section and Board Section can be externally synchronised via front panel connectors. Multi-layered access to the system via Intranet is foreseen through the management of several custom user profiles. In particular, three different access levels have been implemented: Guest, User and Administrator, each of which with password protection. Handy maintenance and upgrading, which constitute a major issue in the reliability of a system, are further guaranteed by the possibility of accessing and servicing the system via network facilities. Actually, the Telnet access facility allows remote debugging and technical support of the system, including future firmware upgrading. For a detailed description of the SY 1527 Universal Multichannel Power Supply System please refer to the *SY 1527 User's Manual.*

**Table 1.1 – Technical specifications of the SY 1527 mainframe**

| | |
|---|---|
| **Packaging** | - 19"-wide, 8U-high Euro-mechanics rack;<br>- Depth: 720 mm. |
| **Weight** | -Mainframe (*): 24 kg<br>-Mod. A1532: 3.2 kg |
| **Power requirements** | *Voltage range*: 100/230 V<br>*Frequency*: 50/60 Hz<br>*Power*: 3400 W |
| **Max. number of boards per crate** | 16 |
| **Max. number of power supply units per crate** | 3 |
| **Primary power supply output (Mod. A 1531)** | ± 12 V, 8 A<br>+5 V, 20 A |
| **Power supply unit output (Mod. A 1532)** | +48 V, 15.6 A |
| **Max. output power** | 2250 W |
| **Operating temperature** | From 0°C (dry atmosphere) to +40°C |
| **Storage temperature** | From -20°C (dry atmosphere) to +50°C |

*(*) One Primary Power Supply (Mod. A 1531) and one Power Supply Unit (Mod. A 1532) are included; boards are not included.*

## 1.3 The Mod. A1676A Branch Controller overview

The Mod. A1676A EASY Branch Controller is implemented in a single width SY1527/SY2527 board. Once plugged in, the Branch Controller must be linked to the EASY crates (placed in the “hostile area”), via front panel connectors (Control and Power Supply). The A1676A is the interface between the mainframe and the remote boards in the EASY crate. It configures the EASY channels as if they belong to the slot in which the branch controller is located: the channels of the EASY boards operate as channels of the A1676A. Up to six EASY crates can be controlled by one A1676A. The provided software tool allows the User to configure the A1676A to operate with any EASY crate layout.

# 2. A4602 CMS Si-Tracker CCU Ring PS Module

## 2.1 Technical description

This document shows the features of the CAEN A4602 CMS Silicon Tracker CCU Ring Power Supply Module, developed for operation in magnetic field and radioactive environment. One A4602 houses four ”Power Supply Units” (PSU0..3), completely floating and handled by a microcontroller, via optoisolators.
Each channel provides a 2.5 V output on the load, adjustable within a ±10% range, with a 7 A maximum current; a maximum 6 V line drop can be compensated via sense wires.
Each PSU is equipped with two temperature sensors to inhibit the regulators in case of high temperature.
The LV regulators ensure the stabilisation of the voltage up to 150m distance (senses wires technique) on active loads, filtered with up to 600 µF.
The LVs are protected against senses wires exchange and shorts.
The board front panel houses LEDs and channels monitor signals, while the channel outputs are provided through a DB female connector on the board backside, which must be connected to the loads through an adapter board.
The board shall be inserted in the EASY4000 crate, which provides the external 48 V power supply, the control bus and the four Interlock lines.

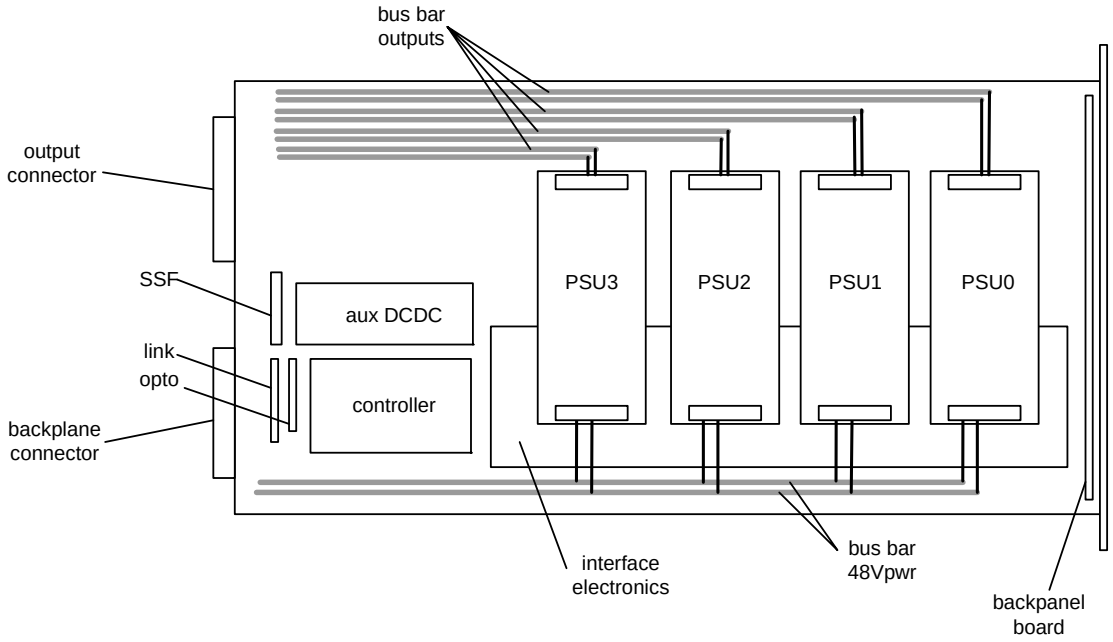


**Fig. 2.1 – A4602 Block Diagram**

## 2.2 Channel Characteristic Table

**Table 2.1 – Channel characteristics of the Mod. A4602 Power Supply Units**

| | |
|---|---|
| **Polarity:** | Floating |
| **Output voltage (connector):** | 8 V |
| **Output voltage (load):** | 2.5 V |
| **Max. Output Current:** | 7 A |
| **Voltage Set/Monitor Resolution:** | 5 mV |
| **Current Set/Monitor Resolution:** | 10 mA |
| **VMAX software:** | 2.75 V |
| **VMAX software resolution:** | 5 m V |
| **Voltage Ripple:** [1] | < 20 mV pp |
| **Voltage Monitor vs. Output Voltage Accuracy:** [2] | typical: ± 0.3% ± 30 mV<br>maximum: ± 0.3% ± 50 mV |
| **Voltage Set vs. Output Voltage Accuracy:** [5] | typical: ± 0.3% ± 30 mV<br>maximum: ± 0.3% ± 50 mV |
| **Current Monitor vs. Output Current Accuracy:** [5] | typical: ± 2% ± 0.05 A<br>maximum: ± 2% ± 0.1 A |
| **Current Set vs. Output Current Accuracy:** [5] | typical: ± 2% ± 0.05 A<br>maximum: ± 2% ± 0.1 A |
| **Load Regulation:** [5] | ± 0.3 % (with sense wires)<br>± 2 % (without sense wires) |
| **Output power:** | 56 W per channel |

[1] From 10 Hz to 15 MHz at full load; measured with the line terminated on a 10 µF capacitance and a 100 nF ceramic capacitance in parallel to the load

[2] From 10% to 90% of Full Scale Range

## 2.3 Front panel components

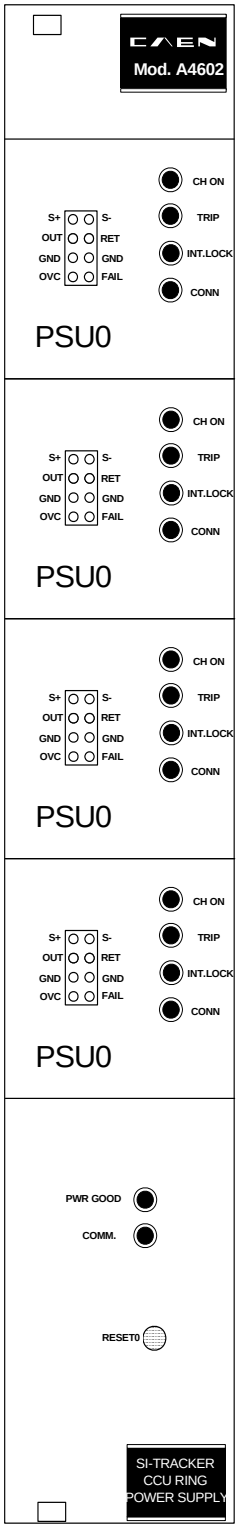


**Fig. 2.2 – A4602 Front Panel**

# 2.4 Technical Specifications

## *2.4.1 Packaging*

The module is housed in a 8 TE wide, 6U-high mechanics.

## *2.4.2 Front panel connections*

The board front panel houses four 8 pin female strips (one per PSU) which provide the following monitor signals:

| | |
|---|---|
| OVC: | Channel in overcurrent |
| RET: | Channel power return |
| OUT: | Channel test point |
| GND: | Channel Ground |
| S±: | LV sense Test Point |

## *2.4.3 Front Panel Displays*

**CH ON LEDs:** *Function:* light up as one channel at least in the relevant Power Supply Unit is on.
*Type:* red LEDs, one per PSU

**PWGOOD LED:** *Function:* light up as the external +48 V power and internal +/-12V and +17V supplies are present.
*Type:* green LEDs, one per PSU

**COMM LEDs:** *Function:* light up as the communications take place.
*Type:* green LEDs, one per PSU

**CONN LEDs:** *Function:* light up according to User's settings.
*Type:* green LEDs, one per PSU

**TRIP LEDs:** *Function:* light up when at least one channel of the PSU is turned off due to trip.
*Type:* red LEDs, one per PSU

**INTERLOCK LEDs:** *Function:* light up as the interlock signal is active.
*Type:* green LEDs, one per PSU

## *2.4.4 Other components*

**RESET pushbuttons:** *Function:* it allows to reset the PSU (one pushbutton per Unit).

### *2.4.5 Backside connections*

**OUTPUT connectors:**

Mechanical specifications:
4 DBV17W2S500G30 15+2pin female connector;
4 DB15 type female connector.

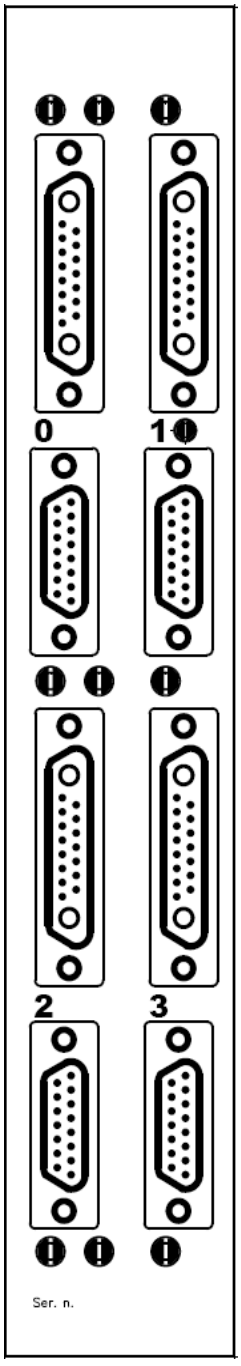


**Fig. 2.3 – A4602 Connection board**

## 2.5 Interlock jumpers

Each PSU has four interlock lines (ILK0÷3). Each line can be enabled (i.e. the PSU can be put in Interlock via the enabled ILK line) by inserting the jumpers on the board side:

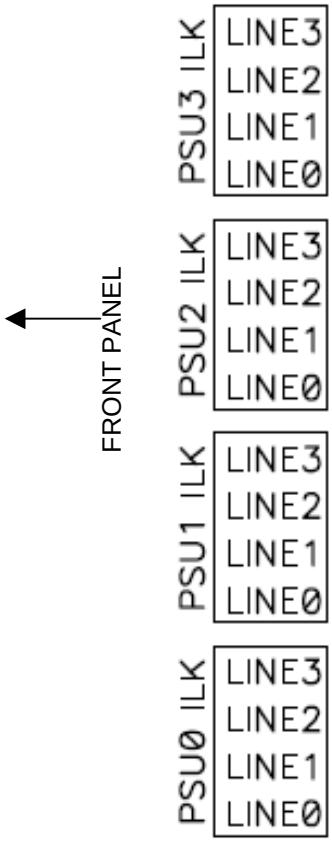


**Fig. 2.4 – A4602 Interlock jumpers**

# 3. Safety information and installation requirements

## 3.1 General safety information

This section contains the fundamental safety rules for the installation and operation of the boards. Read thoroughly this section before starting any procedure of installation or operation of the product.

### *3.1.1 Injury Precautions*

Review the following precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use the product only as specified. Only qualified personnel should perform service procedures.

**Avoid Electric Overload.**
To avoid electric shock or fire hazard, do not apply a voltage to a load that is outside the range specified for that load.

**Avoid Electric Shock.**
To avoid injury or loss of life, do not connect or disconnect cables while they are connected to a voltage source.

**Do Not Operate Without Covers.**
To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

**Do Not Operate in Wet/Damp Conditions.**
To avoid electric shock, do not operate this product in wet or damp conditions.

**Do Not Operate in an Explosive Atmosphere.**
To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

**Do Not Operate With Suspected Failures.**
If you suspect there is damage to this product, have it inspected by qualified service personnel.

## 3.2 Safety Terms and Symbols on the Product

These terms may appear on the product:

- **DANGER** indicates an injury hazard immediately accessible as you read the marking.
- **WARNING** indicates an injury hazard not immediately accessible as you read the marking.
- **CAUTION** indicates a hazard to property including the product.

The following symbols may appear on the product:

**DANGER**

**High Voltage**

**ATTENTION**

**Refer to Manual**

## 3.3 Installation

The Mod. A1676A is a single-width board for the SY1527/2527/3527 systems. At power ON the SY1527 system processor will scan all the slots in the crate to find out where the module is plugged and what kind of module it is.
The A1676A must be connected to the EASYremote crates through the control lines. The control connectors are placed on the A1676A front panel and on the EASY back or front panel respectively.

# 4. Operating modes

The EASY4000 System boards can be controlled, either locally or remotely, through the SY 1527 software interface.
For details on the EASY4000 System, please refer to the User's Manual of the A1676A Branch Controller. For details on SY 1527 system operation, please refer to the User's Manual of this product.

**ATTENTION**

**THE MOD. A1676A and A4602 BOARDS REQUIRE**

**SY 1527 FIRMWARE VERSION 2.01.00 OR LATER**

## 4.1 Output control and monitoring

It is possible, through the SY 1527 system, to handle the following items:
OVER THE A1676A BOARD:

| Name | Description | Value |
|---|---|---|
| Reset | Resets all remote channels controlled by Branch Controller (channels are turned off) | |
| Recovery | Recovers all remote channels controlled by Branch Controller (only communications are reset, not the channels status) | |
| A1676A 48V | Enables / Disables 48 V output of Branch Controller | |
| Upgrade | Selects destination of software downloading | *Remote* on remote board<br>*Local* on A1676A controller |
| Rel | Monitors board firmware release | |
| GlobalON | Turns on all the enabled channels | |
| GlobalOFF | Turns off all the enabled channels | |

OVER THE A4602 PSU:

| Name | Description | Value |
|---|---|---|
| Name | Assigns to the PSU symbolic name | String |
| 12VPwS | Monitors 12V auxiliary low voltages | *OK* if present, *FAIL* if absent |
| 17VPwS | Monitors 17V auxiliary low voltages | *OK* if present, *FAIL* if absent |
| MainPwS | Monitors 48PWR supply status; in case of failure, 48V service is maintained by back up battery and channels can be shut down | *OK* if present, *FAIL* if absent |
| 48VPwS | Monitors main power supply | *OK* if both present, *FAIL* if one absent |
| Sync | Monitors 50 Hz synchronisation | *OK* if present, *FAIL* if absent |
| HVSync | Monitors 625 Hz synchronisation | *OK* if present, *FAIL* if absent |
| RemIlk | Monitors interlock status | |
| RemIlkLn | Interlock line identifier | Real |

| | | |
|---|---|---|
| Rel | Monitors the firmware release number | |
| SerNum | Monitors the board serial number | |
| Status | Monitors status | String |
| RemBdName | Monitors board name | String |
| Lock | Allows to lock the board inside the crate | boolean |
| StdBy | Allows to disconnect the PSU from the load | boolean |
| Temp1 | Monitors heatsink 1 temperature | 4-byte real |
| Temp2 | Monitors heatsink 2 temperature | 4-byte real |

OVER A4602 PSU CHANNELS:

| **Name** | **Description** | **Value** |
|---|---|---|
| ChName | Assigns to channel a symbolic name | String |
| V0Set | Allows to set the output voltage | 4-byte real |
| I0Set | Allows to set the maximum output current | 4-byte real |
| SVMax | Allows to set the software voltage limit | 4-byte real |
| Pw | Allows to switch channel On/Off | boolean |
| VMon | Allows to monitor output voltage | 4-byte real |
| VCon | Allows to monitor connector LV | 4-byte real |
| IMon | Allows to monitor output current | 4-byte real |
| Status | Allows to monitor channel status (see below) | |
| GlbOn | Allows to respond to A1676A “Global On” | boolean |
| GlbOff | Allows to respond to A1676A “Global Off” | boolean |

N.B.: the A4602 PSU0..3 parameters are actually referred to the first channel (CH0); the A4602 Channel parameters are referred to Channels [1..4].
The following messages may be returned by the SY 1527 when monitoring the channel status:

- Up (HV channel ramping up)
- Down (HV channel ramping down)
- Ovc (channel in OVERCURRENT condition, IMon>I0Set)
- Ovv (channel in OVERVOLTAGE condition, VMon>V0Set+3%)
- Unv (channel in UNDERVOLTAGE condition, VMon<V0Set-3%)
- HVMax (channel VMon exceeding max voltage hardware limit)
- I –Tripped (channel Ovc lasting more than Trip time, see § 4.1.1)
- Cal-Err (channel not calibrated)
- Unplugg (board not present)
- Ovv Prot. (VCon exceeding maximum VCon limit)
- Temp Err. (board temperature > 70°C)

If a Temp Error occurs the PSU is turned off; if HVMax, I –Tripped or Ovv Protection is monitored on a LV channel, the relevant PSU is turned off; these conditions are kept, although the alarm cause might be removed, unless a **Clear Alarm** operation is performed. To clear all alarms it’s necessary to select menu “*UTILITY*” in SY1527, then “*CLEAR ALARM”.*

### *4.1.1 Internal Trip*

The regulators are equipped with hardware current limiters which maintain the current at the software current limit (Iset) value, when necessary . The Iset value is software settable from a minimum (> 0 A) to the maximum current foreseen for the regulator (Imax). The suggested default value of Iset is 1/4 of Imax.

### 4.1.2 PSU OPC Items

This chapter describes the items available for the A4602 Power Supply units control.

The **Name** item allows to assign to the PSU a symbolic name.

A read access to the **Temp1** item returns the Heatsink1 temperature.
A read access to the **Temp1#EU** item returns a string with the Temp1 Engineering Units.
A read access to the **Temp1#HighEU** item returns the highest possible Temp1 value.
A read access to the **Temp1#LowEU** item returns the lowest possible Temp1 value.

A read access to the **Temp2** item returns the Heatsink2 temperature.
A read access to the **Temp2#EU** item returns a string with the Temp2 Engineering Units.
A read access to the **Temp2#HighEU** item returns the highest possible Temp2 value.
A read access to the **Temp2#LowEU** item returns the lowest possible Temp2 value.

A read access to the **Rel** item returns the board firmware release.

A read access to the **SerNum** item returns the board serial number.

A read access to the **Status** item returns the board status.

A read access to the **RemBdName** item returns a string with the board name.

A read access to the **12VPwS** item returns the internal ±12 V status.
A read access to the **12VPwS#CoOpen** item returns back the label “Off” associated to 12VPwS=FAIL.
A read access to the **12VPwS#CoClose** item returns back the label “On” associated to 12VPwS=OK.

A read access to the **17VPwS** item returns the internal ±17 V status.
A read access to the **17VPwS#CoOpen** item returns back the label “Off” associated to 17VPwS=FAIL.
A read access to the **17VPwS#CoClose** item returns back the label “On” associated to 17VPwS=OK.

A read access to the **48VPwS** item returns the external +48 V status.
A read access to the **48VPwS#CoOpen** item returns back the label “Off” associated to 48VPwS=FAIL.
A read access to the **48VPwS#CoClose** item returns back the label “On” associated to 48VPwS=OK.

A read access to the **MainPwS** item returns the +48 V PWR status.
A read access to the **MainPwS#CoOpen** item returns back the label “Off” associated to MainPwS=FAIL.
A read access to the **MainPwS#CoClose** item returns back the label “On” associated to MainPwS=OK.

A read access to the **Sync** item returns the external 50 Hz status.
A read access to the **Sync#CoOpen** item returns back the label “Off” associated to Sync=FAIL.
A read access to the **Sync#CoClose** item returns back the label “On” associated to Sync=OK.

A read access to the **HVSync** item returns the external 625 Hz status.

A read access to the **HVSync#CoOpen** item returns back the label “Off” associated to HVSync=FAIL.
A read access to the **HVSync#CoClose** item returns back the label “On” associated to HVSync=OK.

A read access to the **RemIlk** item returns the remote Interlock status.
A read access to the **RemIlk#CoOpen** item returns back the label “Off” associated to PSU=unlocked
A read access to the **RemIlk#CoClose** item returns back the label “On” associated to PSU=locked

A read access to the **RemIlkLn** item returns the Interlock line identifier
A read access to the **RemIlkLn#EU** item returns a string with the RemIlkLn Engineering Units.
A read access to the **RemIlkLn#HighEU** item returns the highest possible RemIlkLn value.
A read access to the **RemIlkLn#LowEU** item returns the lowest possible RemIlkLn value.

The **Lock** item allows to lock the board inside the crate.
A read access to the **Lock#CoOpen** item returns back the label “Off” associated to Lock=Unlocked
A read access to the **Lock#CoClose** item returns back the label “On” associated to Lock=Locked.

The **StdBy** item allows to to disconnect the PSU from the load.
A read access to the **StdBy#CoOpen** item returns back the label “Off” associated to PSU = disconnected.
A read access to the **StdBy#CoClose** item returns back the label “On” associated to PSU = connected.

**Table 4.1 – A4602 PSU items**

| ItemID | Data Type | Access Rights | Description |
|---|---|---|---|
| PowerSupplyName.BoardXX.Chan0.Name | String | R/W | Channel name |
| PowerSupplyName.BoardXX.Chan0.Temp1 | 4-byte real | R | Heatsink1 temperature |
| PowerSupplyName.BoardXX.Chan0.Temp1#EU | String | R | Temp1 EU |
| PowerSupplyName.BoardXX.Chan0.Temp1#HighEU | 8-byte real | R | Temp1 upper limit |
| PowerSupplyName.BoardXX.Chan0.Temp1#LowEU | 8-byte real | R | Temp1 lower limit |
| PowerSupplyName.BoardXX.Chan0.Temp2 | 4-byte real | R | Heatsink2 temperature |
| PowerSupplyName.BoardXX.Chan0.Temp2#EU | String | R | Temp2 EU |
| PowerSupplyName.BoardXX.Chan0.Temp2#HighEU | 8-byte real | R | Temp2 upper limit |
| PowerSupplyName. BoardXX.Chan0.Temp2#LowEU | 8-byte real | R | Temp2 lower limit |
| PowerSupplyName.BoardXX.Chan0.Rel | 2-byte int. | R | Board firmware release |
| PowerSupplyName.BoardXX.Chan0.SerNum | 2-byte int. | R | Board serial number |
| PowerSupplyName.BoardXX.Chan0.Status | 2-byte int. | R | Board status |
| PowerSupplyName.BoardXX.Chan0.RemBdName | String | R | Board name |

| ItemID | Data Type | Access Rights | Description |
|---|---|---|---|
| PowerSupplyName.BoardXX.Chan0.12VPwS | boolean | R | 12VPwS status |
| PowerSupplyName.BoardXX.Chan0.12VPwS#CoOpen | string | R | 12VPwS open label |
| PowerSupplyName.BoardXX.Chan0.12VPwS#CoClose | string | R | 12VPwS close label |
| PowerSupplyName.BoardXX.Chan0.17VPwS | boolean | R | 17VPwS status |
| PowerSupplyName.BoardXX.Chan0.17VPwS#CoOpen | string | R | 17VPwS open label |
| PowerSupplyName.BoardXX.Chan0.17VPwS#CoClose | string | R | 17VPwS close label |
| PowerSupplyName.BoardXX.Chan0.48VPwS | boolean | R | 48VPwS status |
| PowerSupplyName.BoardXX.Chan0.48VPwS#CoOpen | string | R | 48VPwS open label |
| PowerSupplyName.BoardXX.Chan0.48VPwS#CoClose | string | R | 48VPwS close label |
| PowerSupplyName.BoardXX.Chan0.MainPwS | boolean | R | MainPwS status |
| PowerSupplyName.BoardXX.Chan0.MainPwS#CoOpen | string | R | MainPwS open label |
| PowerSupplyName.BoardXX.Chan0.MainPwS#CoClose | string | R | MainPwS close label |
| PowerSupplyName.BoardXX.Chan0.Sync | boolean | R | Sync status |
| PowerSupplyName.BoardXX.Chan0.Sync#CoOpen | string | R | Sync open label |
| PowerSupplyName.BoardXX.Chan0.Sync#CoClose | string | R | Sync close label |
| PowerSupplyName.BoardXX.Chan0.HVSync | boolean | R | HVSync status |
| PowerSupplyName.BoardXX.Chan0.HVSync#CoOpen | string | R | HVSync open label |
| PowerSupplyName.BoardXX.Chan0.HVSync#CoClose | string | R | HVSync close label |
| PowerSupplyName.BoardXX.Chan0.RemIlk | boolean | R | RemIlk status |
| PowerSupplyName.BoardXX.Chan0.RemIlk#CoOpen | string | R | RemIlk open label |
| PowerSupplyName.BoardXX.Chan0.RemIlk#CoClose | string | R | RemIlk close label |
| PowerSupplyName.BoardXX.Chan0.RemIlkLn | 4-byte real | R | Interlock line identifier |
| PowerSupplyName.BoardXX.Chan0.RemIlkLn#EU | String | R | RemIlkLn EU |
| PowerSupplyName.BoardXX.Chan0.RemIlkLn#HighEU | 8-byte real | R | RemIlkLn upper limit |
| PowerSupplyName.BoardXX.Chan0.RemIlkLn#LowEU | 8-byte real | R | RemIlkLn lower limit |
| PowerSupplyName.BoardXX.Chan0.Lock | boolean | R | Lock status |
| PowerSupplyName.BoardXX.Chan0.Lock#CoOpen | string | R | Lock open label |
| PowerSupplyName.BoardXX.Chan0.Lock#CoClose | string | R | Lock close label |
| PowerSupplyName.BoardXX.Chan0.StdBy | boolean | R | StdBy status |
| PowerSupplyName.BoardXX.Chan0.StdBy#CoOpen | string | R | StdBy open label |
| PowerSupplyName.BoardXX.Chan0.StdBy#CoClose | string | R | StdBy close label |

### *4.1.3 Output Channel OPC Items*

This chapter describes the items which are available for the control of the power supply channel.

The **ChName** item allows to assign to the channel a symbolic name.

The **V0set** item allows to set output voltage.
A read access to the **V0set#EU** item returns a string with the Vset Engineering Units.
A read access to the **V0set#HighEU** item returns the highest possible Vset value.
A read access to the **V0set#LowEU** item returns the lowest possible Vset value.

The **I0set** item allows to set max output current.
A read access to the **I0set#EU** item returns a string with the I0set Engineering Units.
A read access to the **I0set#HighEU** item returns the highest possible I0set value.
A read access to the **I0set#LowEU** item returns the lowest possible I0set value.

The **SVMax** item allows to set the software voltage limit.
A read access to the **SVMax#EU** item returns a string with the SVMax Engineering Units.
A read access to the **SVMax#HighEU** item returns the highest possible SVMax value.
A read access to the **SVMax#LowEU** item returns the lowest possible SVMax value.

The **VMon** item returns back the VMon value.
A read access to the **VMon#EU** item returns a string with the VMon Engineering Units.
A read access to the **VMon#HighEU** item returns the highest possible VMon value.
A read access to the **VMon#LowEU** item returns the lowest possible VMon value.

The **VCon** item returns back the VMon value.
A read access to the **VCon#EU** item returns a string with the VMon Engineering Units.
A read access to the **VCon#HighEU** item returns the highest possible VMon value.
A read access to the **VCon#LowEU** item returns the lowest possible VMon value.

The **IMon** item returns back the IMon value.
A read access to the **IMon#EU** item returns a string with the IMon Engineering Units.
A read access to the **IMon#HighEU** item returns the highest possible IMon value.
A read access to the **IMon#LowEU** item returns the lowest possible IMon value.

A read access to the **Status** item returns back a 16 bit pattern indicating channel status, as follows:

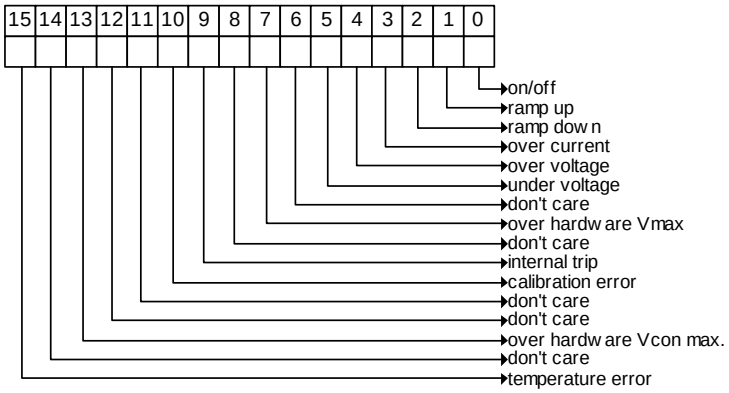


**Fig. 4.1 – Status word**

The **Pw** item allows to switch ON/OFF the channel.
A read access to the **Pw#CoOpen** returns back the label “Off” associated to Pw=0.
A read access to the **Pw#CoClose** returns back the label “On” associated to Pw=1.

The **GlbOn** item enables the channel to respond to the A1676A Global On command.
A read access to **GlbOn#CoOpen** returns back the label “Off” associated to GlbOn=0.

A read access to **GlbOn#CoClose** returns back the label “On” associated to GlbOn=1.

The **GlbOff** item enables the channel to respond to the A1676A Global Off command.
A read access to **GlbOff#CoOpen** returns back the label “On” associated to GlbOff=0.
A read access to **GlbOff#CoClose** returns back the label “Off” associated to GlbOff=1.

**Table 4.2 – A4602 Output Channel items**

| ItemID | Data Type | Access Rights | Description |
|---|---|---|---|
| PowerSupplyName.BoardXX.ChanYYY.Name | String | R/W | Channel name |
| PowerSupplyName.BoardXX.ChanYYY.V0Set | 4-byte real | R/W | Set V0 voltage limit |
| PowerSupplyName.BoardXX.ChanYYY.V0Set#EU | String | R | V0set EU |
| PowerSupplyName.BoardXX.ChanYYY.V0Set#HighEU | 8-byte real | R | V0set upper limit |
| PowerSupplyName.BoardXX.ChanYYY.V0Set#LowEU | 8-byte real | R | V0set lower limit |
| PowerSupplyName.BoardXX.ChanYYY.I0Set | 4-byte real | R/W | Set I0 current limit |
| PowerSupplyName.BoardXX.ChanYYY.I0Set#EU | String | R | I0set EU |
| PowerSupplyName.BoardXX.ChanYYY.I0Set#HighEU | 8-byte real | R | I0set upper limit |
| PowerSupplyName.BoardXX.ChanYYY.I0Set#LowEU | 8-byte real | R | I0set lower limit |
| PowerSupplyName.BoardXX.ChanYYY.SVMax | 4-byte real | R/W | Set software voltage limit |
| PowerSupplyName.BoardXX.ChanYYY.SVMax #EU | String | R | SVMax EU |
| PowerSupplyName.BoardXX.ChanYYY.SVMax#HighU | 8-byte real | R | SVMax upper limit |
| PowerSupplyName.BoardXX.ChanYYY.SVMax#LowEU | 8-byte real | R | SVMax lower limit |
| PowerSupplyName.BoardXX.ChanYYY.VMon | 4-byte real | R | VMon |
| PowerSupplyName.BoardXX.ChanYYY.VMon#EU | string | R | VMon EU |
| PowerSupplyName.BoardXX.ChanYYY.VMon#HighU | 8-byte real | R | VMon upper limit |
| PowerSupplyName.BoardXX.ChanYYY.VMon#LowEU | 8-byte real | R | VMon lower limit |
| PowerSupplyName.BoardXX.ChanYYY.VCon | 4-byte real | R | VConn |
| PowerSupplyName.BoardXX.ChanYYY. VCon#EU | string | R | VConn EU |
| PowerSupplyName.BoardXX.ChanYYY. VCon#HighU | 8-byte real | R | VConn upper limit |
| PowerSupplyName.BoardXX.ChanYYY. VCon#LowEU | 8-byte real | R | VConn lower limit |
| PowerSupplyName.BoardXX.ChanYYY.IMon | 4-byte real | R | IMon |
| PowerSupplyName.BoardXX.ChanYYY.IMon #EU | string | R | IMon EU |
| PowerSupplyName.BoardXX.ChanYYY.IMon#HighU | 8-byte real | R | IMon upper limit |
| PowerSupplyName.BoardXX.ChanYYY.IMon#LowEU | 8-byte real | R | IMon lower limit |
| PowerSupplyName.BoardXX.ChanYYY.Status | 2-byte int. | R | Channel status |
| PowerSupplyName.BoardXX.ChanYYY.Pw | boolean | R/W | Power ON/OFF |
| PowerSupplyName.BoardXX.ChanYYY.Pw#CoClose | string | R | Pw close label |
| PowerSupplyName.BoardXX.ChanYYY.Pw#CoOpen | string | R | Pw open label |
| PowerSupplyName.BoardXX.ChanYYY.GlbOn | boolean | R/W | Enable global ON |
| PowerSupplyName.BoardXX.ChanYYY.GlbOn#CoClose | string | R | GlbOn close label |
| PowerSupplyName.BoardXX.ChanYYY.GlbOn#CoOpen | string | R | GlbOn open label |

| ItemID | Data Type | Access Rights | Description |
|---|---|---|---|
| PowerSupplyName.BoardXX.ChanYYY.GlbOff | boolean | R/W | Enable global OFF |
| PowerSupplyName.BoardXX.ChanYYY.GlbOff#CoClose | string | R | GlbOff close label |
| PowerSupplyName.BoardXX.ChanYYY.GlbOff#CoOpen | string | R | GlbOff open label |